

MoCo Sequestration WorkGroup

Forests and Wetlands

If you would like to propose edits to this document, please use the 'Suggesting mode' (pencil icon, top right) which tracks changes. You can also use comments to ask a question, make a proposal etc, by clicking on the speech icon with a + symbol on the toolbar above.

About

This document has been created and developed by Cynthia Mackie and Doug Boucher. It is based on the discussion and minutes from the Sequestration workgroup's meeting of the 12th of December 2019, focused on Forests and Wetlands and sequestration, and facilitated by Cynthia Mackie and Philip Bogdonoff.

Forests and Wetlands

Overview

The forests, wetlands and other natural ecosystems in Montgomery County must be preserved, restored and expanded as a cornerstone of our overall response to the climate crisis. These ecosystems increase storage of greenhouse gases, moderate flooding, decrease waste water contamination, mitigate extreme heat and drought and protect biodiversity. A recent carbon inventory of the county's land use reveal that forests and trees outside forest remain a critical carbon sink for the county. There are opportunities to increase sequestration from preserving, restoring and managing natural forests and wetlands in the county on both public and private lands. Wetlands are a special case because their organic soils also sequester carbon, they protect and filter water and are especially important for wildlife and endemic plant species. For this reason, expanding wetland habitat can have multiple benefits to the county. Having forests and trees across the County also provide important health, recreational and educational benefits to all inhabitants by providing cleaner air and water, and more opportunities to experience nature and wildlife. Small patches of vegetation throughout the county, also called "micro forests" and urban forests are particularly important to retain and expand as they can sequester carbon and provide sustainably harvested products such as fruit, nuts, and pollen and nectar for both native pollinators and honey bees.

Practices for sequestering carbon through forests and wetlands

Tree and forest loss generate immediate carbon emissions, however tree planting only slowly removes carbon from the atmosphere. For that reason, protecting intact forests and wetlands and restoring natural ecosystems that have been degraded are priorities. Some of these natural ecosystems are public lands managed by the County or State and require strict policies to prevent conversion and more investment to restore and expand them. In particular, aggressive efforts are needed to address the impact of invasive species such as the Emerald Ash Borer. Incentives for private landowners to protect and expand forests and wetlands on their property can have multiple benefits for county residents in addition to increasing carbon sequestration.

** add more here **

Assisted natural regeneration in both terrestrial and wetland ecosystems should also be prioritized, particularly in the critical watersheds. A recent comprehensive study by the Maryland Chapter of the Sierra Club concludes that for key watersheds such as Seneca Creek, forests are the first line of defense in the multiple barrier approach to drinking water protection and provide a foundation for watershed protection. Canopy cover has declined in Watts Branch, Muddy Branch, and Seneca Creek during their study period (2009-2014), and this decline is associated with a decline in stream biological condition over the same general time period. Increased forest and canopy cover would reverse this negative trend and would help to reduce sediment loadings to the Mid Potomac. Costs of increased forest and canopy cover in the case study watersheds are estimated to range from \$33,000 per acre for streamside forest buffers where the land is already publicly-owned, to \$150,000 per acre for retention of existing forests (including land purchase costs). Co-benefits will increase returns for an investment in increasing canopy cover significantly.

The potential contribution of forests and wetlands to sequestering carbon in MoCo

In the period 2011-2016, Montgomery County was nearly 40% “settlement” (developed lands of various intensity) approximately 33% forest, 17% grassland (includes hay/pasture, scrub and lawns), 8% cropland and 2% wetland. The total amount of carbon stored in Montgomery County’s forests and trees is approximately 11.3 million metric tons (or around 41 million tCO₂) as of the latest period of analysis (2011-2016). Around 8.2 million tons of carbon (over 30 million tCO₂) are in forests, and trees outside forests account for around 3.1 million metric tons of carbon (~11 million tCO₂). The amount of carbon stored in all 3 classifications increased between inventory periods.

As noted above, protecting existing forest ecosystems is the most cost effective way to ensure continued sequestration, with restoration of degraded forest patches and riparian areas and expanding both forests and wetlands are crucial secondary strategies. Increasing forests to 40% of the county, and doubling the wetlands to 4% would increase carbon sequestration and improve the overall ecological benefits from natural ecosystems to County inhabitants. Combined with an aggressive tree planting campaign in targeted areas outside forests some estimates are that the overall tree canopy across the county could be increased from 50% to 96% theoretically, although a 25% increase to 75% would be more likely in the 2035 timeframe. The exact carbon sequestration benefits of these actions would need to be modeled and presented in different scenarios.

The institutional limitations and opportunities for realizing this potential contribution

- **Montgomery County Parks Department:** The existing infrastructure and management of most public areas that have forest and wetlands is through the Montgomery County Parks Department, which oversees 422 parks on 36,991 acres, including golf courses, campgrounds, historical sites as well as natural ecosystems. There are a few state and federal lands abutting these county assets, such as part of the C&O Canal park. Some of the challenges are accommodating many conflicting needs for open space, recreational needs and anticipating threats to existing intact forests and wetlands. For example the decimation of ash trees from the invasive insect the emerald ash borer in addition to recent infestations of oak trees makes maintaining intact forests more difficult and costly. In addition, some wetland areas are managed by the WSCC which tends to favor hardscape solutions to managing water rather than green infrastructure such as tree planting and expanding wetlands.
- **MNCPPC:** The MNCPPC also plays a crucial role in the Planning Department and oversees a swathe of programs related to forests, trees, water and wetlands mostly targeting private land. For

example, the Forest Conservation Bank program protects large areas of forest, which are used to meet developer forest mitigation requirements in an offsite location. The Montgomery County Planning Department administers this program by approving bank locations and monitoring transactions between developers and bank owners. Banks may be created by planting a new forest or by protecting an area where forest is already established. Once a bank is established, the forest is protected permanently.

There are opportunities to increase strategic planning across the myriad of these programs with a distinct carbon sequestration focus. New targets are necessary with an eye on envisioning the County in 50 years and the transformational changes needed to start reaching that vision in the next 15 years. Trees are slow growing so we must front load efforts to expand forests and wetlands and increase their overall health and functionality. This should involve direct participation of the public and private sector and an aggressive education effort. In addition, a mechanism to assess the carbon impact of every land use planning decision needs to be adopted.

- **Competing pressures on land-use:** There will be pressures to shrink rather than expand forests and wetlands, and the County Council may need to adopt additional measures to ensure the protection of our county's natural assets. Some of the financial benefits of conservation may need to be assessed in a more quantitative way, including carbon sequestration, wastewater management, clear air and the positive health effects of forests.

Potential scenarios for increasing MoCo's level of sequestration through forests and wetlands

The recommendations of the sequestration workgroup outlined below emphasize phases of action.....

Further research and investigation is needed into x, y and z. See [Questions for Further Research](#) below.

Synergizing and prioritizing across agricultural soils, forests, wetlands and other landscapes

A vision, goal, and objectives for sequestering carbon through forests and wetlands

Vision

Goal and Objectives

This is a Climate Emergency. Ambitious efforts to sequester carbon are not a 'nice to have' but a critical component in efforts to restore a safe, livable climate. The nature-based sequestration systems that are available in MoCo have technical limits in terms of just how much carbon can be sequestered over time in each system, and how long/ deeply it can be sequestered.

It is important to evaluate the potential and limits over time, in terms of metric tons of CO₂e. But it is also important to build a sequestration action plan around a deeper understanding of carbon cycles (fundamental cycle of life), and of the range of additional benefits that a well-managed carbon cycling system provides. An expansive focus on sequestration is fairly new in climate action planning; as yet, approaches and methods for measuring and evaluating these actions to inform and inspire policy-makers, investors, taxpayers, key actors in the system etc, are nascent. However, it is possible to construct an understanding of the multiple values that investments in nature-based sequestration systems can bring, through the identification of co-benefits.

The MoCo sequestration plan should be developed with a goal and a set of linked objectives, as follows:

- Goal for sequestration (such as targeting an increase to 37 forest cover by 2027 and 45% by 2035)
- Objective for co-benefit 1 - Other emissions reductions (e.g. net avoided emissions due to organic waste management at X% to provide on-farm compost)
- Objective for co-benefit 2 - Adaptation/ ecological resilience gains (e.g. reduced flooding/ improved water management due to improved soils)
- Objective for co-benefit 3 - Social equity/ resilience gains (e.g. increased local and nutritious food)
- Objective for co-benefit 4 - Well-being and prosperity gains (e.g. market system and good jobs created around organic waste management)

A potential goal for the Forests and Wetlands focus could be something like.....an increase to 37 forest cover by 2027 and 45% by 2035

The objectives for co-benefits then add additional rationale for investments that achieve this.

Decision-making considerations for MoCo

Criteria for decision-making

There will be important co-benefits of certain actions (some are reflected in the vision and objectives), which should be explicitly recognized and estimated. This will help decision-makers to make the case for those actions where the sequestration value alone is not considered sufficient. There are also potential trade-offs between different actions, as discussed below.

Therefore, the sequestration workgroup proposes that a set of decision-making criteria are developed to ensure that co-benefits and trade-offs are well considered when policies and programs are being developed. These criteria should reflect the principles and values discussed below, and could be applied through a form of check-list that is required for all future policy and legislative decisions.

Trade-offs - and cross-cutting opportunities

It is not possible in advance to list out all the potential trade-offs that could occur as policies and legislation are further developed to support the Climate Action Plan, and other MoCo priorities. However, it is important to make the existence of trade-offs explicit, and to establish ways in which these could be managed e.g. by applying a set of principles like those below. **Some of the trade-offs involving forests and other land uses (and debates concerning them) have already been explored in the Agriculture section of this report, above.**

Co-benefits

Conversely, some potential trade-offs, such as having to make choices about whether to spend money on x or y, could, if appreciated from the perspective of being part of a system (see next section), represent important cross-cutting opportunities and co-benefits. One example would be the imperative to move to zero waste, which includes a commitment to scaling composting of organic waste, and the imperative to generate organic fertilizer at a scale and quality that farmers can use to support sequestration through soils.

There are important co-benefits to be found along all aspects of nature-based sequestration solutions. For example, more trees are needed in agricultural landscapes, and the integration of fruit and nut trees can create benefits such as food and income diversity.

One very important adaptation co-benefit of forests and wetlands comes from the fact that the largest area of land that could feasibly be reforested is upstream of the area where most of the county's residents live. Our watersheds in Montgomery County predominantly have flows from the north and west to the south and east, from the Agricultural Reserve down into the suburban and urban areas where most of the county's population resides. For this reason, reforestation would provide large benefits in terms of reducing extremes of streamflow, lowering the probability and severity of flooding, reducing erosion and sediment loads, and reducing the hazards and dangers to life associated with excess runoff.

Principles and Values

- **Foster systems thinking and adaptive management:** Actively identify and evaluate the social, ecological and economic co-benefits and potential trade-offs of policy and legislative decisions, and how these will impact the County's emissions, sequestration and adaptation targets. Design programs and partnership to ensure a high level of interaction and learning among key actors stimulating adaptive management capacities through incentivizing innovation, rapid feedback loops, taking small bets etc.
- **Apply systems analysis to design plans and programs:** Identify the "levers" or the approaches to changing underlying drivers of change in the system, such as legislation and regulations, tax mandates and incentives, programmatic services, market forces, voluntary actions, etc. The levers of change need to target the drivers, e.g. what motivates people to take action, what factors cause emissions increases, in order to dramatically change the system's performance. Climate Plan strategies need to be selected based upon criteria designed to take into consideration such factors such as cost efficiency, emissions reduction potential, degree of county control, speed at which impact can be achieved, and other relevant factors that relate to deep and sustained systems change.
- **Promote social equity, climate and restorative justice:** Prioritise benefits and opportunities for disadvantaged groups, address systemic and historical discriminations, and protect the right of future generations to a safe and secure climate.
- **Protect and enhance biodiversity and ecological resilience:** Value each nature-based sequestration system for its wider role in enabling critical ecosystems to recover, and to maintain the redundancy and diversity that supports ecosystem resilience over time.
- **Do not count sequestration as a way of off-setting lack of progress on emissions reductions:** Efforts to sequester carbon should not be used to off-set limited progress on the County's emissions reduction targets. They should be valued as an independent contribution to negative emissions and enhanced biodiversity, ecological and social resilience.
- **Base decisions on resilience/ adaptation principles:** Resilience/ adaptation practice has shown the importance of certain [principles](#) that need to be considered in policy-making and business contexts for enhanced resilience. These include the principles of promoting flexibility and learning, maintaining diversity and redundancy, and expanding participation

Are there any considerations/ examples specific to Forests and Wetlands to include here?

Recommendations for sequestration through forests and wetlands

Quick wins, small bets and no regrets actions for 2020

These are actions that can and should be taken now by MoCo, even while the Climate Action Plan is being finalized. They are actions that fit with on-going policies and programs and/or can be justified in light of the County's Climate Emergency Mobilization Resolution and will likely generate a range of co-benefits and no 'bads'.

Overarching Recommendation	Specific Recommendations	Comments
<p>Adopt a goal of increasing the county's forest area to 37% in 2027 and 45% in 2035 (compared to 34% in 2001-2016)</p>	<p>Adoption of a specific numerical goal by the County Government is important as a guideline and commitment, showing our recognition of the need to accelerate the recovery of our natural ecosystems in light of the climate crisis.</p>	<p>According to the WRI GHG Inventory and other GIS-based data sources, the county's forest area has just remained stable over the past two decades. Losses of forest to development have totally offset the contribution from natural regeneration and tree planting combined. This is not acceptable given the climate emergency that the County has declared, particularly in light of the fact that reforestation is the natural climate solution with the greatest potential (Fargione et al. 2018, <i>Science Advances</i>)</p>
<p>Establish a policy for the county of no further loss of wetlands.</p>	<p>This policy should not be a <u>no-net</u>-loss policy, which is weaker, but rather a commitment to preserving all the (limited area of) wetlands that remain in the county.</p>	<p>No-net-loss of wetlands, the U.S. national policy since the G.H.W. Bush administration, is inadequate, since it allows created wetlands to substitute for natural ones that are destroyed. Interventions that impact wetlands should be limited to those needed to control infestations of invasive species such as purple loosestrife and Phragmites.</p>

Scaling-out 2021-27

Overarching Recommendation	Specific Recommendations	Comments
<p>Reforest, through both tree-planting (where necessary) and natural regeneration (where possible), large blocks of forest on County-owned land using native tree species.</p>	<p>Areas prioritized for reforestation should include:</p> <ul style="list-style-type: none"> • those in county parks that are currently leased for cropping (especially those with high-emissions cropping systems such as annual row crops -- e.g. corn, soy and wheat) and • those that are mowed simply for visual purposes. <p>Sports fields and other high-density recreational areas should be excluded.</p>	<p>Reforesting open lands already in public ownership is a straightforward step that the county can take, with triple benefits: increased sequestration from forests, reduced emissions from high-emissions cropland, and providing a visible example to the public of the County's commitment to changing land use towards a more climate-friendly landscape.</p>
<p>Amend the county's Forest Conservation Act (FCA) which requires developers to either preserve forest or pay to protect or establish substitute forests elsewhere, so as to strengthen the incentives for both preservation and reforestation.</p>	<p>Currently the FCA requires either protection of substitute forests on a 2 acres for 1 acre lost basis, or reforestation on a 1 for 1 basis. These should be increased to 4 to 1 for protection and 2 to 1 for reforestation.</p>	<p>The current FCA has mostly served only to maintain a constant forest cover (about 34%), with losses to development offsetting the gains from tree-planting and natural regeneration. The FCA's approach needs to change from simply offsetting losses, to increasing the amount of forest on private land.</p>
<p>Provide substantial tax benefits for reforestation by private landowners, with increasing per-acre rates over time as forests grow up and increase their carbon stock, and as land values for other uses in the county increase.</p>	<p>The tax benefits could probably be provided most efficiently through the local property tax, but other options should be explored as well. The value of the benefit and its rate of increase need to be high enough to incentivize both the preservation of currently existing forests, and a substantial amount of reforestation.</p>	<p>Tax benefits for reforestation are complementary to the FCA, and have the advantage of de-linking new reforestation from the losses of land to suburban sprawl.</p>
<p>Request that other public land-managing agencies in the county cooperate with us in developing ecosystem restoration plans on watershed and county-wide levels, as well as plans to share the costs involved.</p>	<p>These other public land management agencies include the National Park Service, Maryland State Parks and Wildlife Management Areas, NIH, the Department of Defense, and others.</p>	<p>There can be substantial economies of scale and benefits to effectiveness in coordinating with other public agencies.</p>

<p>Review the county's land use planning processes and zoning regulations to identify those provisions that either encourage or discourage reforestation and forest and wetland preservation.</p>	<p>This review should be the basis for expanding the positives and amending or eliminating the negatives, in terms of climate protection.</p>	<p>The county's land use policies and provisions have evolved over many decades during which the focus and underlying assumptions have changed considerably. Climate was only a minor consideration, or totally absent as a concern, during most of this history.</p>
<p>Use the county's excellent GIS data system to identify locations where natural regeneration of forests is likely to succeed, without the need for tree planting.</p>	<p>This information should be shared with landowners, accompanied by information on the county's Forest Conservation Act and other incentives for reforestation. Examples of such locations include those close to large parcels of forest and those bordered by tall trees of reproductive size (generally 12" DBH or more) along field edges.</p>	<p>Where forests can be regenerated naturally from seed input of nearby trees, the costs involved will be much lower than if tree-planting is necessary. Often all that will be required is to fence off the area and leave it fallow. This can make the cost-benefit tradeoff for private landowners tip strongly in the direction of reforestation.</p>
<p>Hold field days, site visits, seminars and other events at sites that have successfully been reforested in Montgomery County.</p>	<p>Examples of both natural regeneration and successful tree-planting should be included.</p>	<p>The experience of both the county's Economic Development staff and the Cooperative Extension Service (in the county and nationwide) has shown that field events are one of the most effective ways to spread the word to landowners. Seeing is believing.</p>
<p><i>NOTE: Establishment of small forests and street-side tree planting should also be part of our recommendations, but I'm assuming that these are best placed in the "Suburban and urban land use" section of the report.</i></p>		

Bold new ideas and future thinking

Overarching Recommendation	Specific Recommendations	Comments
<p>Develop a long-term plan to restore forests and wetlands by 2035 on all areas of county parks not required for other uses (e.g. sports fields, visitor centers).</p>	<p>The restoration should be either to forests or to wetlands (which are by far the two main kinds of natural vegetation in the county), according to the characteristics of the site.</p>	<p>Montgomery County was predominantly forested, with limited areas of wetland, at the time of European settlement. Meadows, lawns and other kinds of grasslands are not native to the county, and have lower carbon stocks and biodiversity levels.</p>
<p>Change the traditional focus of parkland establishment in the county, which has emphasized stream valleys, to one that includes uplands on an equal basis.</p>		<p>The stream valley focus is traditional in the county and indeed throughout the US, and is vital for watershed protection and mitigating the impacts of suburban development. But the limited area of stream valley in the county means that this focus is inadequate to provide the large amount of sequestration and climate adaptation that will be needed in coming decades.</p>

Managing Uncertainties

Questions for further research

- 1) While we already have fairly good data showing the rates of sequestration that can be achieved from reforestation, most of this is on a regional or national basis, rather than being collected in the environment of Montgomery County. Spatially-explicit data collection and modelling that is specific to our local conditions would be very helpful in sharpening our plans and clarifying the rates of sequestration that can be achieved.
- 2) Land values, particularly those that compete with forest use (e.g. cropping, livestock, suburban development) have a critical impact on whether landowners have sufficient incentives to restore natural ecosystems. There is already a great deal of data (e.g. tax and assessment records) relevant to this issue; the need is to analyze it according to land use type, taking into account different scenarios and policy options over coming decades.
- 3) Two negative factors that can limit rates of tree growth and survival, and thus rates of carbon sequestration, are overbrowsing by our abundant white-tailed deer population, and competition from invasive species (e.g. Asian bittersweet vine, Emerald ash borer, Phytophthora root rot, etc.) Research into simple and possibly quite inexpensive solutions to these problems in Montgomery County conditions (e.g. fencing, clipping of vines) could pay off handsomely in providing land owners and managers with ways to increase carbon sequestration rates and reforestation success.

Annex 1: Excerpts from MoCo Climate Mobilization Report
Recommendations, 2018